applied to most catchments within the CONUS regardless of NHD flow designation (i.e., intermittent versus perennial).

How can our map be used to support conservation and restoration? – A major challenge in conservation and restoration of streams is determining where to best place limited financial resources towards these efforts. Our map of Pr(good) could provide an important tool for guiding these efforts within the US. For example, if the goal of a land manager is to identify and conserve streams that are in good biological condition, our map can be queried to select streams that meet these criteria. As an illustration, we selected streams that were within the upper 95^{th} percentile of Pr(good) values within each NARS region and mapped them by their Strahler stream order (Fig. 7). Within several regions (e.g., WMT), 1^{st} order streams showed the highest potential for conservation. In contrast, 5^{th} – 8^{th} order streams showed the highest potential for conservation in the TPL region. Managers could use this type of information to develop strategies to maintain the biological integrity of these streams and rivers. In the WMT region, many of these streams occur on Federal land and their condition could be maintained through careful management of extractive land uses. In the TPL region, a strategy to maintain the biological condition of these rivers could include working with local land owners to plant and preserve riparian corridors in agricultural lands; a major land use category within this region. Furthermore, tributaries to these rivers could be restored to support the good condition predicted at these locations and to expand the distribution of streams in good biological condition from those identified in this query.

To maximize the likelihood of successful restoration, additional information could be used in conjunction with our predictions. Restoration is most likely to be successful where the cause of stream impairment can be tied to local activity, but the upstream watershed remains relatively intact (Harmon et al. 2012, Kail et al. 2015). Furthermore, likelihood of post-restoration improvements in biological condition increase if nearby reaches are in good biological condition, which can act as a source of native taxa for recolonization of restored reaches (Lake et al. 2007, Palmer et al. 2014). Stream segments within the NHD that fit these criteria can be identified with queries of the ICI and IWI maps of Thornbrugh et al. (in review) and our map of Pr(good). First, NHD segments with both low Pr(good) and low ICI values could represent biologically impaired stream reaches where local factors (i.e., low ICI) contribute to this impairment. This query could be further refined by identifying those stream segments with high IWI values, suggesting an intact contributing watershed. Thus, the predicted biological impairment in these streams is likely due to local conditions and not to chronic upstream impairment. Finally, this pool of candidate streams could be further filtered by identifying those that have neighboring streams with high Pr(good), thus increasing the likelihood of dispersal of native taxa from nearby reaches. We applied an example of these criteria to the ICI, IWI, and our map of Pr(good). In this illustration we selected non-headwater streams with Pr(good) < 0.5 and ICI < 0.62 (i.e., the 1^{st} quartile of ICI values), but with IWI > 0.75 (i.e., higher IWI than the national average). For headwater streams, we excluded the criteria of IWI > 0.75 because the catchment and watershed are the same geographic unit (Fig. 2), and restoration of the ICI would result in a commensurate increase in IWI as well. This query identified more than 8,000 km of streams within the CONUS that met these criteria (see Table 3 and Fig. 8). Notably, more than half of these stream lengths (4,833 km) were within the TPL region alone and were almost entirely comprised of 1^{st} order catchments (Fig. 8), suggesting that local restoration efforts within this region could substantially improve biological conditions within the upper Mississippi Basin. Additional geospatial (e.g., land ownership) and local information (e.g., stakeholder interactions) could be used to further refine this list of candidate streams. Although this approach may overlook worthwhile restoration efforts that do not meet the above criteria, it provides an objective and easily implemented way to prioritize candidate streams. Furthermore, these approaches to identify streams for potential conservation or restoration are flexible because we mapped predicted probabilities of good condition rather than condition classes (i.e., good versus poor). In this way, these criteria can be adjusted to expand or restrict the pool of candidate streams as needed.

Model decisions and implications. – The model decisions we explored in this study substantially affected predictions produced by the final models and may provide insight into improving other ecological models. For example, several studies have examined the effect of variable selection on RF model performances (Evans et al. 2010). However, in an examination of model selection with the same data used here, Fox et al. (in prep) showed that variable selection played a negligible role in model performance and can lead to instability of model predictions. Instead, we found that balancing the number good and poor sites during model development, excluding fair sites, and developing regional models improved model bias and precision. Parallels to these decisions may be found in other ecological modeling contexts. One such parallel is imbalanced detections of occurrence in species distribution modeling (Haibo and Garcia 2009) and balancing observations in RFs should improve the sensitivity and specificity of these models. In addition, the availability of biological datasets has increased and their aggregation has become a common practice in ecological modeling. However, this scenario may be similar to our attempt at developing a single, national model and care must be taken to ensure consistency among datasets and avoid biased predictions.